NASA SBIR/STTR Technologies

S2.02-9261 - Optical Precision Deployment Latch

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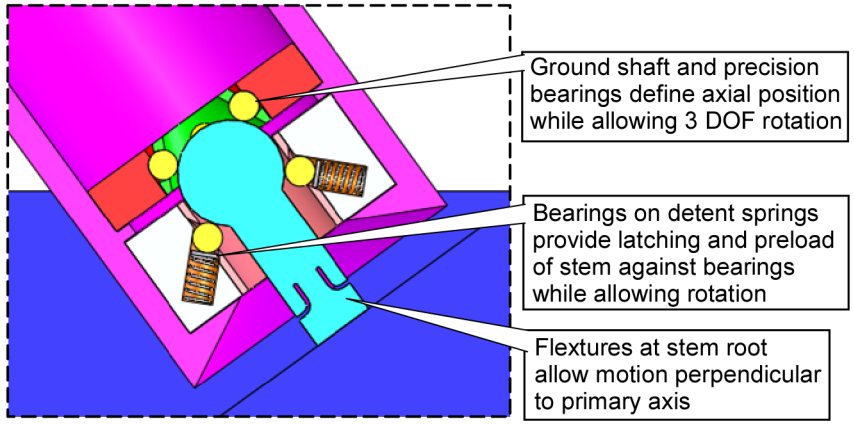
Identification and Significance of Innovation

Virtually all optical science instruments benefit from greater aperture. For space-based instruments whose geometries are constrained by the launch vehicle, increasing the aperture requires deployment and then precise and stable latching of the deployed optical components into defined positions. Existing latching technology is too inaccurate, unstable, and expensive for use in many NASA missions.

Physical Sciences Inc. (PSI) will develop a simple, scalable latching technology by applying precision design approaches that carefully manage the friction and strain energy stored internal to the latching mechanism. The result will be a small, low-cost latching system with sub-micron positional repeatability and dynamic stability.

During the Phase I efforts, the PSI team will design, build, and test a latch for a cubesat-scale application. In future phases, PSI will fully qualify the device and demonstrate its performance when integrated into a complete deployable optical system.



L-0840a

Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

Technical Objectives and Work Plan

The overall technical goal of the Optical Precision Deployment Latch program is to provide NASA and other government organizations with a low-cost latch that precisely locates optical components and holds them stably during operation.

The goals of the Phase I program are to demonstrate the feasibility of the approach and to apply the technology to a small telescope deployed on a 6U cubesat platform. This Phase I work will lead directly to a cubesat flight system and to scaling to other space and terrestrially based opportunities. The specific technical objectives that will be accomplished in the Phase I to meet these goals and to provide a solid basis from which to perform further work are to:

1. Perform an overall systems analysis of the stiffness and precision required by a representative 6U deployable telescope support structure
2. Design and build multiple latch prototypes to fit the 6U cubesat form factor
3. Test the latch prototypes to determine their macroscopic and microscopic performance
4. Extrapolate the latch performance to the resultant performance of the representative deployable space telescope.

NASA Applications

Precision latching of deployed assembled optical components has long been a challenge for NASA observatories ranging in size from cubesat to Terrestrial Planet Imager. A family of low-cost but precise latch systems would have application to stellar observatories as well as atmospheric measurement systems. In addition to data gathering, optical systems are also used by NASA for high bandwidth laser communications.

Non-NASA Applications

There are many DoD and IC applications of earth observing telescopes that would benefit from larger, deployed apertures. In addition to government users, there are a wide range of commercial applications for precision restraint of optical components. During the SBIR efforts, PSI will focus on augmenting our line of ophthalmological diagnostic and medical research tools.

Firm Contacts

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